

DRAFT

**WASHINGTON ADVENTIST HOSPITAL AND
COLUMBIA UNION COLLEGE
JOINT LOCAL AREA TRANSPORTATION REVIEW
TAKOMA PARK, MARYLAND**

Prepared for:
Washington Adventist Hospital and
Columbia Union College

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INTRODUCTION

This report presents the results of a joint Local Area Transportation Review (LATR) of the proposed expansions of Washington Adventist Hospital (WAH) and Columbia Union College (CUC). The subject sites are located in the City of Takoma Park, in the Silver Spring/Takoma Park policy area of Montgomery County, Maryland, as shown on Figure 1. The study area is generally bounded by Carroll Avenue on the south, Maplewood Avenue on the north, Maple Avenue and Sligo Creek on the west, and Greenwood Avenue to the east, as shown on Figure 2.

WAH proposes to expand the existing hospital tower by 42,500 S.F. to provide more inpatient rooms (not adding any new beds and thus no impact on traffic assumed in this report), to expand its emergency department by 5,500 S.F., to expand the existing power plant building by 3,000 S.F. (not generating any additional traffic demands), and to construct a 144,000 S.F. proposed ambulatory care facility (ACF) comprised of ambulatory clinic and physician office space on the main campus. With this expansion project and displacement of 24,566 S.F. of existing space, approximately 124,934 S.F. of net additional space would generate additional traffic and parking demands.

Columbia Union College (CUC) is similarly preparing a long-range development plan for expansion of college facilities intended to return enrollment from the current 710 full-time traditional students to 1,100 full-time traditional students, by updating existing facilities and regaining buildings that have been lost in recent decades. CUC's plans include: a performing arts theater with a 600-seat auditorium, an enlarged and updated gymnasium to replace the existing gymnasium on the campus, private memberships for community residents to use the health club components of the proposed Wellness Center, and a Learning Pavilion with a 150-person lifelong learning center component. At the request of the Maryland National Capital Park and Planning Commission (MNCPPC), the City of Takoma Park, and the community, this transportation study analyzes the buildout of both institutional campuses. It should be

noted that the development proposed by Columbia Union College is permitted under the current zoning and would not require a local area transportation review as part of the expansion.

The County's standards for conducting local area transportation reviews does not require either WAH or CUC to consider the other in analyzing adequacy of the local road network unless plans for each are pending APFO approval. Nevertheless, for purposes of addressing long-term impacts of the long-range buildout plans for each institution, we are including the planned buildout of each in this analysis.

The scope of this traffic study was established in consultation with the Maryland-National Capital Park and Planning Commission (MNCPPC). Copies of the MNCPPC letter describing the study scope for each project are included in Appendix A.

This study includes evaluations of the following intersections:

1. University Boulevard/Carroll Avenue.
2. Carroll Avenue/Flower Avenue.
3. Carroll Avenue/Washington Adventist Hospital Driveway.
4. Carroll Avenue/Ethan Allen Avenue.
5. Carroll Avenue/Philadelphia Avenue.
6. Maple Avenue/Philadelphia Avenue.
7. Maple Avenue/Sligo Creek Parkway/Hilltop Road.
8. Maple Avenue/Sligo Creek Parkway/Washington Adventist Hospital Driveway.
9. Piney Branch Road/Flower Avenue.
10. Carroll Avenue/Greenwood Avenue.
11. Greenwood Avenue/Division Street.
12. Greenwood Avenue/Maplewood Avenue.
13. Flower Avenue/Division Street/Columbia Union College Driveway.
14. Flower Avenue/Maplewood Avenue (east intersection).
15. Flower Avenue/Maplewood Avenue (west intersection).

Tasks undertaken in this study included the following:

1. Review WAH and CUC proposed development plans, previous traffic studies, and other background data.
2. Field reconnaissance of existing roadway and intersection geometrics, traffic controls, traffic signal phasings, and speed limits.
3. Meetings with MNCPPC staff, the City of Takoma Park, and the Citizens Advisory Committee (CAC).
4. Counts of existing traffic at fifteen off-site intersections.
5. Analysis of existing critical lane volumes at each of these intersections.
6. Projection of background future traffic volumes based on existing traffic counts and traffic generated by one other approved but un-built pipeline development.
7. Calculation of background critical lane volumes at each key intersection based on background traffic forecasts, existing traffic controls, and existing intersection geometrics.
8. Estimation of the number of weekday AM and PM peak hour trips that will be generated by the proposed WAH and CUC expansions based on standard Institute of Transportation Engineers (ITE) trip generation rates and other independent studies.
9. Distribution of site-generated trips based on existing traffic counts at the WAH and CUC driveways and off-site intersections.
10. Identification of total future traffic forecasts based on background traffic forecasts plus WAH and CUC site traffic assignments.

11. Calculation of total future critical lane volumes and identification of road improvements needed to mitigate WAH and CUC site traffic impacts.
12. Sensitivity analysis evaluating WAH and CUC traffic separately.
13. Analysis of traffic signal warrants at the WAH Driveway on Carroll Avenue.
14. Calculation of staging ceiling capacity with the WAH and CUC expansions.

Sources of data for this analysis included the FY 2003 Annual Growth Policy (AGP); MNCPPC's July 2002 Local Area Transportation Review Guidelines; the 2000 Takoma Park, East Silver Spring, and Silver Spring Central Business District master plans; traffic counts conducted by Wells & Associates; the Institute of Transportation Engineers (ITE), SHA, Washington Adventist Hospital, Foulger-Pratt Companies, Ellerbe-Beckett (architects), Columbia Union College, and VIKI (site civil engineers).

The conclusions of this traffic study are as follows:

1. ***Currently all studied intersections operate within the 1,650 CLV standard for the Silver Spring/Takoma Park Policy Area.***
2. ***Pipeline projects in the study area, will generate a total of 4 to 6 new peak hour trips upon completion.***
3. ***In the future, without the proposed WAH or CUC projects, all studied intersections would continue to operate below the 1,650 CLV standard.***
4. ***The proposed WAH expansion and CUC expansion will add another 388 new AM peak hour trips and 709 new PM peak hour trips, to the public street system assuming full project completion for both the WAH and CUC long-range plans.***

5. With the WAH and CUC expansions, all studied intersections will continue to operate below the 1,650 CLV standard for Silver Spring/Takoma Park Policy Area, with the exception of the Carroll Avenue/Flower Avenue intersection. This intersection would require a separate eastbound right turn lane to adequately serve site-generated traffic.
6. With the full WAH expansion and without the CUC expansion, all studied intersections would operate below the 1,650 CLV standard without any road improvements. Similarly, with the full CUC expansion and without the WAH expansion, all studied intersections would operate below the 1,650 CLV standard without any road improvements.
7. A traffic signal warrant analysis prepared for the unsignalized WAH driveway on Carroll Avenue indicates four of the six studied warrants are met under existing conditions. Five of the six warrants are met under future conditions with the WAH and CUC expansions. This indicates that a signal is required at this location.
8. Sufficient staging ceiling capacity is currently available in the Silver Spring/Takoma Park policy area to adequately accommodate the WAH and CUC expansions.



Figure 1
Site Location Map





Figure 2
Local Area Aerial Photo



BACKGROUND DATA

Public Road Network

Existing Network. Regional access to WAH and CUC is provided by University Boulevard (MD Route 193) and MD Route 410. Local access is provided by Carroll Avenue (MD Route 195), Maple Avenue, Greenwood Avenue, Division Street and Flower Avenue (MD Route 787). Existing intersection lane use and traffic control at key intersections in the site vicinity are shown on Figure 3.

University Boulevard (MD Route 193) is a six-lane, divided roadway with a posted speed of 40 miles per hour (mph). It is designated as a major highway in Montgomery County. The intersection of University Boulevard and Carroll Avenue operates under signal control.

MD Route 410 is a two-lane, undivided arterial roadway with a posted speed of 25 mph in the vicinity of the site. Through Takoma Park, MD Route 410 is designated by two names, Ethan Allen Avenue east of Carroll Avenue and Philadelphia Avenue west of Carroll Avenue.

Carroll Avenue is a two-lane, undivided, north-south, arterial roadway. The posted speed limit is 30 mph north of the WAH and CUC site and 25 mph south of the site. The intersections of Carroll Avenue with Flower Avenue, Ethan Allen Avenue, and Philadelphia Avenue are controlled by traffic signals.

Maple Avenue is a two-lane, undivided roadway with a posted speed limit of 25 mph. The intersection of Maple Avenue and Philadelphia Avenue operates under signal control. The intersections of Maple Avenue with Sligo Creek Parkway and Hilltop Road operate under stop-sign control.

Flower Avenue is a two-lane, undivided arterial roadway. The posted speed limit on this roadway is 25 mph.

Greenwood Avenue is a two-lane, undivided roadway with a posted speed of 25 mph. Curb parking is permitted in the vicinity of the site on the south side of the street.

Maplewood Avenue is a two-lane, undivided roadway with a posted speed of 25 mph. The roadway serves CUC and residences between Greenwood Avenue and Maple Avenue, and is offset at the intersection with Flower Avenue.

Programmed Improvements. No improvements are known to be currently programmed in the site vicinity.

Planned Improvements. The Takoma Park Master Plan, approved and adopted in December 2000, recommends the addition of an eastbound left turn lane on Philadelphia Avenue and removal of the split phasing at the intersection with Maple Avenue.

The Maryland State Highway Administration (SHA) is conducting a traffic calming study on Carroll Avenue between Flower Avenue and University Boulevard.

No additional improvements are known to be planned in the immediate site vicinity.

Public Transportation Services

WAH and CUC are served by one Metrobus route and five Ride-On lines, as shown in Table 1 and on Figure 4.

- The Metrobus Calverton Express Line Route Z19 runs Monday through Friday from Calverton Boulevard to the Silver Spring Metro Station. The bus stops on Carroll Avenue at Takoma Academy during the morning and evening peak periods.
- The Ride-On Route 12 bus travels between the Silver Spring and Takoma Metro Stations seven days per week. The bus stops on Carroll Avenue at Flower Avenue approximately every 30 minutes during non-rush hours

Table 1
 WAH and CUC Joint LATR
 Current Public Transit Routes

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| Provider | Route No. | Route Name |
|----------|-----------|----------------------------|
| Metrobus | Z19 | Calverton Express Line |
| Ride-On | 12 | Silver Spring-Takoma |
| Ride-On | 13 | Silver Spring-Takoma |
| Ride-On | 17 | Silver Spring-Langley Park |
| Ride-On | 18 | Silver Spring-Langley Park |
| Ride-On | 25 | Takoma-Takoma |

Notes: Information provided by the Washington Metropolitan Area Transit Authority and the Montgomery County Department of Public Works and Transportation.

and approximately every 15 minutes during peak commuter periods.

- The Ride-On Route 13 bus travels between the Silver Spring and Takoma Metro Stations on weekdays only. The bus stops on Carroll Avenue at Flower Avenue approximately every 20 to 30 minutes during peak commuter periods only.
- The Ride-On Route 17 bus travels between the Silver Spring Metro Station and Langley Park. The bus stops on Carroll Avenue at Flower Avenue approximately every 15 to 20 minutes during peak commuter hours.
- The Ride-On Route 18 bus travels between the Silver Spring Metro Station, the Takoma Metro Station, and Langley Park all days except Sunday. The bus stops on Carroll Avenue at Flower Avenue approximately every 15 to 30 minutes.
- The Ride-On Route 25 bus runs weekdays and weekends to and from Takoma Metro Station along Maple Avenue and Houston Avenue. The bus stops on the WAH campus approximately every fifteen minutes during the peak commuter hours.

WAH Site Access Concept

Access to WAH is provided at three locations, as shown on Figure 2:

1. On the south side of the campus on Carroll Avenue.
2. On the west side of the campus on Maple Avenue.
3. On the east side of the campus on Flower Avenue (exit only).

All turning movements onto and off of the WAH campus are permitted at the Carroll Avenue and Maple Avenue driveways. The driveways on Carroll Avenue and Maple Avenue are controlled by stop signs. The driveway on Flower Avenue is an exit for employees only and is controlled by a mechanical gate.

CUC Site Access Concept

CUC provides surface parking for students, faculty, staff, and visitors in several surface parking areas on the campus. Access to these parking areas is provided on Flower Avenue, Greenwood Avenue, and Maplewood Avenue. On-street parking is also available along Flower Avenue, Greenwood Avenue, Division Street, and Maplewood Avenue. Closure of Division Street is proposed with the CUC expansion, displacing the existing on-street parking and requiring a redistribution of campus traffic in the future.

Existing Traffic Counts

WAH Campus Counts. Wells & Associates conducted peak period counts of the number of vehicles entering and exiting the WAH campus at each of the three driveways (exit only at Flower Avenue) on Tuesday, January 8, and Wednesday, October 2, 2002.

CUC Campus Counts. Counts of peak period traffic were conducted at seven locations providing direct access to the CUC campus on Tuesday, October 1, 2002.

Off-Site Intersection Counts. Wells & Associates conducted traffic counts during the AM and PM peak hours on Tuesday, October 1, 2002 and Wednesday October 2, 2002 at the following intersections:

1. University Boulevard/Carroll Avenue.
2. Carroll Avenue/Flower Avenue.
3. Carroll Avenue/Washington Adventist Hospital Driveway.
4. Carroll Avenue/Ethan Allen Avenue.
5. Carroll Avenue/Philadelphia Avenue.
6. Maple Avenue/Philadelphia Avenue.
7. Maple Avenue/Sligo Creek Parkway/Hilltop Road.
8. Maple Avenue/Sligo Creek Parkway/Washington Adventist Hospital Driveway.
9. Piney Branch Road/Flower Avenue.
10. Carroll Avenue/Greenwood Avenue.

11. Greenwood Avenue/Division Street.
12. Greenwood Avenue/Maplewood Avenue.
13. Flower Avenue/Division Street/Columbia Union College.
14. Flower Avenue/Maplewood Avenue (east intersection).
15. Flower Avenue/Maplewood Avenue (west intersection).

The results are included in Appendix B and summarized on Figure 5.

Pipeline Developments

One pipeline development was considered in this traffic study. This development is an approved 2,310 S.F. office building, limited to nine employees by approval condition, located on the west side of Grant Avenue 200 feet north of the Carroll Avenue/Ethan Allen Avenue intersection.

ANALYSIS

Critical Lane Volume Standard

WAH and CUC are located in the Silver Spring/Takoma Park policy area of Montgomery County. The critical lane volume standard in this policy area is 1,650, according to the latest Annual Growth Policy (AGP). Site traffic impacts must be mitigated in cases where the existing or projected critical lane volume exceeds this standard.

Existing Intersection Critical Lane Volumes

Existing peak hour critical lane volumes were estimated at the nine existing key off-site intersections based on the existing lane usage and traffic control shown on Figure 3, the existing traffic volumes shown on Figure 5, and MNCPPC's critical lane volume intersection capacity analysis procedure. The results are presented in Appendix C and summarized in Table 2.

Table 2 indicates that each of these intersections currently operates within the 1,650 CLV standard for Silver Spring/Takoma Park.

The WAH Carroll Avenue driveway operates at an 879 CLV, or 53 percent of the standard, during the AM peak hour, and at a 788 CLV, or 48 percent of the standard, during the PM peak hour. The WAH Maple Avenue driveway operates at a 553 CLV, or 34 percent of the standard, during the AM peak hour, and at a 569 CLV, or 34 percent of the standard, during the PM peak hour.

The main CUC driveway on Flower Avenue at Division Street operates at a 313 CLV, or 19 percent of the standard, during the AM peak hour, and at a 400 CLV, or 24 percent of the standard, during the PM peak hour.

Table 2
WAH and CUC Joint LATR
Peak Hour Intersection Critical Lane Volumes

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| Intersection | County Standard (1) | Existing | | Background | | Total Future | |
|---|------------------------|----------|-------|------------|-------|--------------|-------|
| | | AM | PM | AM | PM | AM | PM |
| 1 Carroll Avenue/University Boulevard | 1,650 | 1,446 | 1,219 | 1,446 | 1,219 | 1,541 | 1,404 |
| 2 Carroll Avenue/Flower Avenue | 1,650 | 1,179 | 1,332 | 1,179 | 1,334 | 1,372 | 1,725 |
| <i>With addition of exclusive eastbound right turn lane</i> | | | | | | | |
| 3 Carroll Avenue/WAH Entrance | 1,650 | 879 | 788 | 879 | 788 | 1,136 | 1,254 |
| 4 Carroll Avenue/Ethan Allen Avenue | 1,650 | 1,259 | 1,114 | 1,260 | 1,116 | 1,300 | 1,176 |
| 5 Carroll Avenue/Philadelphia Avenue | 1,650 | 800 | 970 | 801 | 971 | 804 | 998 |
| 6 Maple Avenue/Philadelphia Avenue | 1,650 | 984 | 1,268 | 986 | 1,271 | 1,000 | 1,280 |
| 7 Maple Avenue/Hilltop Road | 1,650 | 694 | 636 | 694 | 636 | 723 | 672 |
| 8 Maple Avenue/Sligo Creek Parkway/WAH Entrance | 1,650 | 553 | 569 | 553 | 569 | 598 | 681 |
| 9 Piney Branch Road/Flower Avenue | 1,650 | 922 | 935 | 922 | 935 | 933 | 992 |
| 10 Carroll Avenue/Greenwood Avenue | 1,650 | 750 | 676 | 750 | 678 | 920 | 818 |
| 11 Greenwood Avenue/Division Street | 1,650 | 66 | 97 | 66 | 97 | NA | NA |
| 12 Greenwood Avenue/Maplewood Avenue | 1,650 | 33 | 44 | 33 | 44 | 88 | 155 |
| 13 Flower Avenue/Division Street/CUC Driveway | 1,650 | 313 | 400 | 313 | 400 | 396 | 529 |
| 14 Flower Avenue/Maplewood Avenue East | 1,650 | 311 | 450 | 311 | 450 | 398 | 629 |
| 15 Flower Avenue/Maplewood Avenue West | 1,650 | 300 | 343 | 300 | 343 | 387 | 494 |

Notes: ¹ CLV Standard in the Silver Spring/Takoma Park Policy Area is 1,650.

Pipeline Development Traffic

The number of peak hour trips that will be generated by the 2,310 S.F. pipeline office building was estimated based on standard MNCPPC trip generation rates. This small project is anticipated to generate only four (4) AM peak hour trips, and six (6) PM peak hour trips.

Background Traffic Forecasts

These pipeline trips were assigned to the public road network according to the "Trip Distribution and Traffic Assignment Guidelines" appropriate to the Takoma Park area, provided by MNCPPC staff. The resulting traffic assignments are shown on Figure 6. These assignments were added to counts of existing traffic to yield the future background traffic volumes shown on Figure 7.

Background Future Intersection Critical Lane Volumes

Future peak hour critical lane volumes, without the WAH and CUC expansions, were estimated at the key intersections in the study area based on the existing lane usage and traffic control shown on Figure 3, the background traffic forecasts shown on Figure 7, and the CLV intersection capacity analysis procedure, in accordance with MNCPPC guidelines. The results are presented in Appendix E and summarized in Table 2.

Table 2 indicates that all of the LATR intersections will continue to operate within the 1,650 CLV standard applicable in Silver Spring/Takoma Park.

Site Trip Generation

Proposed WAH Expansions. The existing hospital consists of a total of 455,092 S.F. of space, as shown in Table 3. This includes 62,546 S.F. of medical office space, 11,360 S.F. of mechanical space, 22,186 S.F. of clinical space, and 359,000 S.F. of hospital space.

WAH proposes to expand the existing hospital by 42,500 S.F. to provide more inpatient rooms (though no additional beds are being added), to expand the emergency room by 5,500 S.F., to expand the power plant building by 3,000 S.F. (not generating any additional traffic demands), and to construct a 144,000 S.F. ACF. The hospital expansion and proposed ACF would displace 24,566 S.F. of existing space. Thus, 170,434 net S.F. of space would be added to the WAH campus (i.e., $195,000 - 24,566 = 170,434$).

The 42,500 S.F. hospital expansion and the 3,000 S.F. power plant addition **would not** generate additional traffic or parking demands, since no additional patients, physicians, or staff would occupy this space. This same assumption was used in the recent Holy Cross and Montgomery General Hospital LATR's, according to MNCPPC staff. The remaining 124,934 S.F. of net additional space **would** generate additional traffic and parking demands (i.e., $170,434 - (42,500 + 3,000) = 124,934$).

Existing WAH Trip Generation Rates. MNCPPC defines the AM "peak hour" as the highest four consecutive 15-minute periods between 6:30 and 9:30 AM, and the PM "peak hour" as the highest four consecutive 15-minute periods between 4:00 and 7:00 PM.

The existing WAH campus generates 614 AM peak hour trips, and 656 PM peak hour trips, as shown in Table 4. This includes WAH trips observed at the main campus driveways, at the Takoma Academy, and on off-site public streets, as shown in Table 5.

Table 3
WAH and CUC Joint LATR
WAH Existing and Proposed Development Programs

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| Building | Use | Amount | Units |
|--|------------------------------------|---------|-------|
| <u>Existing Buildings (1)</u> | | | |
| Hospital Building | | 359,000 | S.F. |
| Lisner Building | Clinical Space | 9,900 | S.F. |
| 7620 Conference Center Building | Conference Center | 4,546 | S.F. |
| | Clinical Space | 4,740 | S.F. |
| | Medical Office | 5,380 | S.F. |
| | Subtotal | 14,666 | S.F. |
| 7901 Maple Medical Plaza Building | Clinical Space | 3,000 | S.F. |
| | Medical Office | 10,000 | S.F. |
| | Subtotal | 13,000 | S.F. |
| Mechanical Building | Mechanical | 3,600 | S.F. |
| Power Plant Building | Mechanical | 7,760 | S.F. |
| Existing Physician's Office Building | Medical Office | 47,166 | S.F. |
| | Subtotal for Medical Office | 62,546 | S.F. |
| | Subtotal for Mechanical Space | 11,360 | S.F. |
| | Subtotal Clinical Space | 22,186 | S.F. |
| | Subtotal for Hospital | 359,000 | S.F. |
| Total Square Footage | | 455,092 | S.F. |
| <u>Proposed Expansion</u> | | | |
| Hospital Building (2) | Clinical Serv. (Modernization) (3) | 42,500 | S.F. |
| | Clinical Serv. (Emergency Dept.) | 5,500 | S.F. |
| | Hospital Subtotal | 48,000 | S.F. |
| Power Plant Building Addition | Mechanical (3) | 3,000 | S.F. |
| Proposed Ambulatory Care Facility (2) | Conference Center | 4,546 | S.F. |
| | Clinical Space | 67,454 | S.F. |
| | Medical Office Space | 72,000 | S.F. |
| | Ambulatory Care Facility Subtotal | 144,000 | S.F. |
| Proposed Expansion Total | | 195,000 | S.F. |
| <u>Displaced Uses</u> | | | |
| Conference Center Building | Conference Center | 4,546 | S.F. |
| | Clinical Space | 4,740 | S.F. |
| | Medical Office | 5,380 | S.F. |
| | Subtotal | 14,666 | S.F. |
| Lisner Building | Clinical Space | 9,900 | S.F. |
| Displaced Uses Total | | 24,566 | S.F. |
| <u>Future Buildings</u> | | | |
| Hospital | | 421,360 | S.F. |
| Clinical Space | | 75,000 | S.F. |
| Medical Office | | 129,166 | S.F. |
| Total | | 625,526 | S.F. |
| <u>Net Additional Space</u> | | 170,434 | S.F. |
| <u>Modernization Space (3)</u> | | 45,500 | S.F. |
| <u>Net Additional Space Generating Traffic and Parking Demands</u> | | 124,934 | S.F. |

Notes:

(1) Source: Ellerbe Becket, Washington Adventist Hospital Facility Master Plan, November 30, 2000.

(2) Source: Ellerbe Becket, November 6, 2002.

(3) Includes expansion space for modernization and circulation links. This space will not generate additional traffic or parking demands.

Table 4
 WAH and CUC Joint LATR
 WAH Trip Generation Rate Comparison (Observed vs. ITE) (1)

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| Scenario/ Use | Amount | Units | AM Peak Hour | | PM Peak Hour | |
|--|--------------|-------|--------------|-------|--------------|--------|
| | | | In | Out | In | Out |
| | | | | Total | | Total |
| <u>Observed Trip Generation (2)</u> | | | | | | |
| Hospital/Medical Office Campus Trips | 455,092 S.F. | | 414 | 200 | 269 | 386 |
| Trips per 1,000 S.F. | | | 0.91 | 0.44 | 0.59 | 0.85 |
| <u>ITE Trip Generation</u> | | | | | | |
| Hospital Trips (3) | 392,546 S.F. | | 278 | 103 | 87 | 274 |
| Medical Office Trips | 62,546 S.F. | | 122 | 30 | 53 | 144 |
| Subtotal | 455,092 S.F. | | 400 | 133 | 140 | 418 |
| Trips per 1,000 S.F. | | | 0.88 | 0.29 | 0.31 | 0.92 |
| Difference in Trip Rates (Observed vs. ITE Estimate) | | | 0.03 | 0.15 | 0.28 | (0.07) |
| Percent Difference | | | 3.3% | 34.1% | 47.5% | -8.2% |
| | | | | | | 14.6% |

Notes:

- (1) Existing campus square footage based on the Ellerbe Beckett, Washington Adventist Hospital Facility Master Plan, November 30, 2000.
- (2) Observed trip generation based on counts conducted by W&A at the WAH campus on Tuesday, January 8, 2002, and Wednesday, October 2, 2002, at Takoma Academy on Tuesday, January 29, 2002, and on off-site public streets on Thursday, March 28, 2002.
- (3) Hospital square footage includes mechanical space located on the campus.

Table 5
WAH and CUC Joint LATR
WAH Trip Generation Analysis

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| Component | Square Feet | AM Peak Hour | | | PM Peak Hour | | | |
|---|----------------|--------------|-------|-------|--------------|-------|-------|-----|
| | | In | Out | Total | In | Out | Total | |
| <u>Existing Washington Adventist Hospital Campus (1)</u> | | | | | | | | |
| On-Site | 455,092 | 313 | 185 | 498 | 223 | 324 | 547 | |
| Takoma Academy | - | 82 | 12 | 94 | 35 | 48 | 83 | |
| Off-Site Public Streets | - | 19 | 3 | 22 | 11 | 14 | 26 | |
| Subtotal | 455,092 | 414 | 200 | 614 | 269 | 386 | 656 | |
| <u>Expansion</u> | | | | | | | | |
| <u>Hospital Expansion (2)</u> | | | | | | | | |
| Clinical Space (Modernization) (3) | 42,500 | - | - | - | - | - | - | |
| Clinical Space (4) | 5,500 | 4 | 2 | 6 | 1 | 5 | 6 | |
| Subtotal | 48,000 | 4 | 2 | 6 | 1 | 5 | 6 | |
| Power Plant Building Addition (3) | - | 3,000 | - | - | - | - | - | |
| <u>Proposed Ambulatory Care Facility</u> | | | | | | | | |
| Conference Center Space (4) | 4,546 | 4 | 1 | 5 | 1 | 4 | 5 | |
| Clinical Space (4) | 67,454 | 54 | 20 | 74 | 17 | 54 | 71 | |
| Medical Office Space (5) | 72,000 | 158 | 40 | 198 | 69 | 188 | 257 | |
| Subtotal | 144,000 | 216 | 61 | 277 | 87 | 246 | 333 | |
| <u>Displaced Area (2,6)</u> | | | | | | | | |
| Conference Center Space (4) | (4,546) | (4) | (1) | (5) | (1) | (4) | (5) | |
| Clinical Space (4) | (14,640) | (12) | (4) | (16) | (4) | (11) | (15) | |
| Medical Office Space (5) | (5,380) | (12) | (3) | (15) | (6) | (18) | (24) | |
| Subtotal | (24,566) | (28) | (8) | (36) | (11) | (33) | (44) | |
| Subtotal | - | 170,434 | 192 | 55 | 247 | 77 | 218 | 295 |
| Total | 625,526 | 606 | 255 | 861 | 346 | 604 | 951 | |
| <u>Difference (Expanded vs. Existing Washington Adventist Hospital)</u> | | | | | | | | |
| Trips | | 192 | 55 | 247 | 77 | 218 | 295 | |
| Percent | | 46.4% | 27.5% | 40.2% | 28.6% | 56.4% | 45.0% | |

Notes:

- (1) Observed trip generation based on counts conducted by W&A at the WAH campus on Tuesday, January 8, 2002, and Wednesday, October 2, 2002, at Takoma Academy on Tuesday, January 29, 2002, and on off-site public streets on Thursday, March 28, 2002.
- (2) Source: Foulger Pratt Companies, Inc. and Ellerbe Becket.
- (3) Includes expansion space for modernization and vertical cores. This space will not generate additional traffic or parking demands.
- (4) Based on Institute of Transportation (ITE) trip generation rates/equations for hospitals.
- (5) Based on Institute of Transportation (ITE) trip generation rates/equations for medical office buildings.
- (6) Displaced area includes the existing conference center building and Lisner Building.

These observations are slightly higher than the number of peak hour trips that would be estimated for the existing hospital and ambulatory care uses based on standard Institute of Transportation Engineers' (ITE) trip generation rates. The AM peak hour ITE estimates are 81 trips, (or 13.3 percent) fewer than observed. The PM peak hour ITE estimates are 98 (or 14.6 percent) fewer trips than observed. To provide a conservative estimate, the ITE rates for hospitals and medical office buildings were, therefore, increased by the appropriate percentage and used to estimate the number of trips that would be generated by the proposed WAH expansion.

WAH Net Additional Trips. The proposed hospital expansion and proposed ACF are anticipated to add 247 net additional AM peak hour trips, and 295 net additional PM peak hour trips, as shown in Table 5. This represents a 40.2 percent increase in existing AM peak hour trips, and a 45.0 percent increase in existing PM peak hour trips.

Proposed CUC Expansions. Columbia Union College has a current enrollment of 710 full-time traditional students. The long-range development plan for the campus consists of the following components:

- a. Return of the student population from 710 to 1,100 full-time traditional students.
- b. A 600-seat performing arts theater.
- c. An updated and expanded gymnasium that will replace the existing gymnasium and allow the gathering of the entire student body for special events. It is anticipated that this facility would continue to function similar to current conditions, only reaching capacity during special events occurring a few times a year.
- d. Private memberships for community residents to use the health club components of the proposed Wellness Center.

- e. A Learning Pavilion with a 150-person lifelong learning center component.

CUC Trip Generation Rates. Traffic generation estimates for the various components of the proposed CUC expansion program were derived based on studies prepared by Wells & Associates, independent studies of similar uses, and other published sources. Specific data is contained in Appendix F.

CUC Net Additional Trips. The proposed CUC expansion is anticipated to add 141 net additional AM peak hour trips, and 414 net additional PM peak hour trips, as shown in Table 6.

Total Combined WAH and CUC Net Additional Trips. The trip generation analyses for the WAH and CUC expansions are anticipated to add 388 net additional AM peak hour trips, and 709 net additional PM peak hour trips.

Trip Distribution

WAH Trip Distribution. The distribution of peak hour trips generated by WAH was determined based on turning movement counts at each of the three existing driveways and at off-site intersections.

The Carroll Avenue, Maple Avenue, and Flower Avenue driveways presently carry 74, 26, and 0 percent of all inbound site-generated trips, respectively. They carry 68, 27, and 5 percent of all outbound site-generated trips, respectively.

The single largest turning movements are the inbound right turn movement from southbound Carroll Avenue, which accounts for 58 percent of all inbound traffic, and the outbound left turn movement onto northbound Carroll Avenue, which accounts for 53 percent of all outbound traffic.

This distribution was assumed to apply to the expanded WAH campus in the future.

Table 6
WAH and CUC Joint LATR
CUC Trip Generation Analysis

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| Use | Amount | Units | AM Peak Hour | | | PM Peak Hour | | |
|---|--------|----------|--------------|-----|-------|--------------|-----|-------|
| | | | In | Out | Total | In | Out | Total |
| Student Enrollment (1) | 390 | Students | 71 | 24 | 95 | 81 | 66 | 147 |
| <u>Center for Performing Arts Theater (2)</u> | 600 | Seats | - | - | - | 235 | - | 235 |
| <u>Health Services Gymnasium (3)</u> | 1,000 | Seats | - | - | - | 239 | 2 | 241 |
| <u>Health Club (4)</u> | 250 | Members | 4 | 7 | 11 | 12 | 9 | 21 |
| <u>Learning Pavilion Lifelong Learning Center (5)</u> | 150 | Seats | 35 | - | 35 | - | 5 | 5 |

Notes:

- (1) Trip generation based on counts conducted by Wells & Associates on Wednesday, December 4, 2002. hour. The evening classes scheduled at the Columbia Union College campus may be the reason for the discrepancy.
- (2) Trip generation based on methodology used in Traffic Impact Study Grosvenor Metro Parking Garage Strathmore Concert Hall, prepared by Street Traffic Services Studies, Ltd. And dated September 3, 1999.
- (3) Trip generation based on Wells & Associates experience and engineering judgement.
- (4) Trip generation based on rates from Sport and Health - Roundhouse Square Traffic & Parking Analysis, prepared by Wells & Associates, LLC and dated October 25, 2001.
- (5) Trip generation based on assumptions of capture rates and auto occupancy. Diurnal distributions based on New Washington Convention Center Transportation Management Plan, prepared by De Leuw, Cather, Gorove/Slade Associates, and Legion Design/Campbell & Associates Chartered and dated April 28, 1997.

CUC Trip Distribution. The distribution of peak hour trips generated by CUC was determined based on turning movement counts at each of the college's existing driveways and at off-site intersections. Adjustments were made to the existing CUC trips to reflect the closing of Division Street.

The results indicate that approximately 38 percent of all site-generated trips would approach from the north on Carroll Avenue. Approximately 36 percent of the site-generated trips would approach from the west on Flower Avenue and Greenwood Avenue. Fourteen percent of site trips would approach from the east on Flower Avenue. The remaining 12 percent would be distributed to the south on Carroll Avenue (seven percent) and Maple Avenue (five percent).

Total Future Traffic Forecasts

The net new trips generated by the WAH and CUC expansions, presented in Table 7, were assigned to the public road network according to the directional distributions discussed previously. The resulting site traffic assignments are shown on Figures 8 and 9. These assignments were added to the future background traffic volumes shown on Figure 7 to yield the total future traffic forecasts shown on Figure 10.

Total Future Intersection Critical Lane Volumes

Future peak hour critical lane volumes, with the proposed WAH and CUC expansions, were estimated at the key intersections in the study area based on the existing lane usage and traffic control shown on Figure 3, the total future traffic forecasts shown on Figure 10, and the CLV intersection capacity analysis procedure, in accordance with MNCPPC guidelines. The results are presented in Appendix H and summarized in Table 2.

Table 7
 WAH and CUC Joint LATR
 WAH and CUC Trip Generation Summary

DRAFT

| Development/Use | Amount | Units | AM Peak Hour | | PM Peak Hour | |
|---------------------------|--------------|--------------|--------------|-----|--------------|-----|
| | | | In | Out | In | Out |
| WAH Expansion | 124,934 S.F. | | 192 | 55 | 77 | 218 |
| CUC Expansion | | 390 Students | 110 | 31 | 332 | 82 |
| Net Additional Site Trips | | | 302 | 86 | 409 | 300 |
| | | | | | | 709 |

The results indicate the following:

1. The WAH/Carroll Avenue driveway would operate at a 1,136 CLV, or 69 percent of the standard, during the AM peak hour, and at a 1,254 CLV, or 76 percent of the standard, during the PM peak hour.
2. The WAH/Maple Avenue driveway would operate at a 598 CLV, or 36 percent of the standard, during the AM peak hour, and at a 681 CLV, or 41 percent of the standard, during the PM peak hour.
3. The CUC driveway at Flower Avenue would operate at a 396 CLV, or 24 percent of the standard, during the AM peak hour, and at a 529 CLV, or 32 percent of the standard, during the PM peak hour.
4. The Carroll Avenue/Flower Avenue intersection would operate beyond capacity (CLV 1,725) based on the current lane geometry. The addition of an eastbound right turn lane would be required to restore this intersection to acceptable levels (CLV 1,559).
5. All of the remaining intersections within the study area would continue to operate at acceptable levels of service (CLV less than or equal to 1,650) during both the AM and PM peak hours.

Sensitivity Analysis

A sensitivity analysis was prepared for the Carroll Avenue/Flower Avenue intersection assuming development of the WAH or CUC proposals separately.

The traffic forecasts and analyses are summarized in Appendix I and indicate that this intersection would operate below the 1,650 critical lane volume standard without any road improvements with either the WAH or CUC

expansions. Therefore, if only one of the development proposals is approved and constructed, the additional eastbound right turn lane at the Carroll Avenue/Flower Avenue intersection would not be required.

Signal Warrant Analysis

A traffic signal warrant study was prepared for the unsignalized hospital driveway on Carroll Avenue for existing and total future conditions. This analysis is based on 12-hour traffic counts collected at the intersection, and the background data and forecasts previously outlined in this report.

Each critical component of the WAH and CUC projects was analyzed in order to derive 12-hour volume estimates for the intersection. Average daily traffic forecasts were converted to hourly volumes for each turning movement. The hourly distributions are based on data published by ITE and independent studies prepared by Wells & Associates. The traffic volume forecasts are summarized in Appendix J.

The warrant study focused primarily on the traffic volume related warrants (Warrants 1, 2, and 3). Other warrants were excluded that are not applicable or information was not available. A listing of all of the relevant traffic signal warrants are outlined below:

1. Warrant 1, Eight-Hour Vehicular Volume
 - 1A. Minimum Vehicular Volume
 - 1B. Interruption of Continuous Traffic
 - 1C. Combination of Warrants
2. Warrant 2, Four-Hour Volume
3. Warrant 3, Peak hour
 - 3A. Peak Hour Delay
 - 3B. Peak Hour Volume

The results indicate that four of the six applicable warrants are met under current conditions. The majority of these warrants relate to traffic volume and delay. This indicates that a traffic signal is currently warranted at this location.

Under future conditions with the WAH and CUC expansions, one additional warrant (Peak Hour Volume) is met. Meeting these warrants indicates that a signal is required at this location. The results of the signal warrant studies are summarized in Table 8.

Staging Ceiling Capacity Analysis

WAH and CUC are located within the Silver Spring/Takoma Park policy area of Montgomery County. According to the FY 2003 Annual Growth Policy, the Silver Spring/Takoma Park policy area has a net staging ceiling capacity of 1,238 jobs. The proposed WAH and CUC expansions would generate another 261 jobs. With approval of the proposed WAH and CUC expansions, a net staging ceiling capacity of 977 jobs would remain. Accordingly, sufficient staging ceiling capacity is currently available to adequately accommodate the proposed expansions.

Table 8
 WAH and CUC Joint LATR
 Carroll Avenue/Washington Adventist Hospital Driveway
 Signal Warrant Analysis Results

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| Warrant | Existing Conditions | | Total Future Conditions | |
|---|---------------------|----------------------|-------------------------|----------------------|
| | Hours Met | Warrant Satisfied | Hours Met | Warrant Satisfied |
| 1A. 8-Hour Minimum Vehicular Volume | 8 | Yes | 9 | Yes |
| 1B. 8-Hour Interruption of Continuous Traffic | 5 | No | 6 | No |
| 1C. 8-Hour Combination of Warrants | 8 | Yes | 11 | Yes |
| 2. 4-Hour Vehicular Volume | 4 | Yes | 10 | Yes |
| 3A. Peak Hour Delay | 9 | Yes | 11 | Yes |
| 3B. Peak Hour Volume | 0 | No | 4 | Yes |

CONCLUSIONS

The conclusions of this traffic study are as follows:

1. Currently all studied intersections operate within the 1,650 CLV standard for the Silver Spring/Takoma Park Policy Area.
2. Pipeline projects in the study area, will generate a total of 4 to 6 new peak hour trips upon completion.
3. In the future, without the proposed WAH or CUC projects, all studied intersections would continue to operate below the 1,650 CLV standard.
4. The proposed WAH expansion and CUC expansion will add another 388 new AM peak hour trips and 709 new PM peak hour trips, to the public street system assuming full project completion for both the WAH and CUC long-range plans.
5. With the WAH and CUC expansions, all studied intersections will continue to operate below the 1,650 CLV standard for Silver Spring/Takoma Park Policy Area, with the exception of the Carroll Avenue/Flower Avenue intersection. This intersection would require a separate eastbound right turn lane to adequately serve site-generated traffic.
6. With the full WAH expansion and without the CUC expansion, all studied intersections would operate below the 1,650 CLV standard without any road improvements. Similarly, with the full CUC expansion and without the WAH expansion, all studied intersections would operate below the 1,650 CLV standard without any road improvements.
7. A traffic signal warrant analysis prepared for the unsignalized WAH driveway on Carroll Avenue indicates four of the six studied warrants are

met under existing conditions. Five of the six warrants are met under future conditions with the WAH and CUC expansions. This indicates that a signal is required at this location.

8. Sufficient staging ceiling capacity is currently available in the Silver Spring/Takoma Park policy area to adequately accommodate the WAH and CUC expansions.

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